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THE MUSICAL TIMES, And Singing Class Circular.

JANUARY 1st, 1863.

A DRAUGHT FOR THE PARTICULAR HISTORY OF PHONICS: OR, THE DOCTRINE OF SOUND AND HEARING.

From LORD BACON'S "SYLVA SYLVARUM."

(Continued from page 352.)

SECTION XIX.

THE REFLEXION OF SOUNDS.

There are three kinds of reflexion in sounds—viz., 1, concurrent; 2, iterant, or echo; and 3, super-reflexion, or the echo of an echo. The reflexion of visible objects, by mirrors, may be commanded, because passing in right lines they may be directed to any point; but the reflexion of sounds is hard to direct, because a sound, filling larger spaces in arched lines, cannot be so guided; whence the ways of making artificial echoes have not been practised. And no echo, yet known, returns in a very narrow space.

The natural echoes are made by walls, woods, rocks, hills, and banks. As for water being near, it makes a concurrent, but farther off, an iterant echo; for there is no difference between the concurrent echo and the iterant, besides the quickness or slowness of the return. But water, doubtless, helps the propagation of the echo, as well as of original sounds.

If a person speak in a trunk stopped at the farther end, the blast returns upon the mouth; but no sound at all; for the closeness which preserves the original, is not able to preserve the reflected sound. Besides, echoes are seldom created but by loud sounds; whence there is less hope of making artificial echoes in air, confined within a narrow concave. Yet it has been tried that by leaning over a well twenty-five fathoms deep, and speaking, though but softly, the water returned an audible echo. It should also be tried whether speaking in caves, where there is no issue except in the mouth, will not yield an echo, as wells do.

Echoes move, as original sounds do, in a sphere of air. It were proper to try the production of echoes, where the reflecting body makes an angle, as against the return of a wall, &c. In mirrors, there is the like angle of incidence, from the object to the glass, as from the glass to the eye. And if a running ball be struck sideways, the rebound will be as much the contrary way; and whether there be any such reflexion in echoes may be tried—that is, whether a person will hear better by standing on the side of the reflecting body, than by standing where the voice is, or anywhere, in a right line, between. Trial, likewise, should be made by standing nearer the place of reflexion than the speaker; and again, by

standing farther off, to find whether echoes, as well as original sounds, be not strongest near hand.

In many places may be heard a number of echoes one after another—that is, when there is a variety of hills or woods, some nearer, some farther off, so that the return from the farther being last created, will be likewise last heard. As the voice goes round the person who speaks, so does the echo, for there are many back-echoes, as well as front ones.

To make an echo report three, four, or five words distinctly, it is requisite that the reflecting body be at a good distance; for if it be near, yet not so near as to make a concurrent echo, it chops with you of a sudden. It is necessary, likewise, that the air be not much confined; for air confined at a great distance, has the same effect as air at large, in a small distance. And therefore, in the trial of speaking in the well, though the well was deep, the voice came back suddenly, and would bear the report but of two words.

With regard to echoes upon echoes, there is a curious instance thereof, about three or four miles from Paris, near a town called Pont-Charenton, upon the river Seine. The room is a chapel, with the walls all standing, both at the sides and at the ends, and two rolls of pillars, after the manner of aisles; the roof is open, and no arch-work remaining near any of the walls. There was against every pillar a stack of billets piled above a man's height, which the watermen that bring wood down the Seine in sacks laid there for their convenience. Speaking at the one end, it returned the voice thirteen several times, and I was told that it would return it sixteen times; for I was there about three of the clock in the afternoon, and it is best, as all echoes are, in the evening. It is manifest this is not different echoes from several places, but a tossing of the voice, as a ball, different ways; like reflections in looking-glasses, where, if you place one glass before and another behind, you shall see the glass behind, and the image within the glass before, and again the glass before in that; and many such super-reflexions, till the images of the object fail, and die at last, being in every return weaker and more shadowy. So the voice in that chapel makes succeeding super-reflexions, melting by degrees, and every reflexion growing weaker than the former. Thus, if you speak three words, it will, for three times, perhaps, report the whole three words, then the two latter words for a few times, and then the last word alone a few times, still fading and growing weaker. And whereas in echoes of one return, it is extraordinary to hear four or five words; in this echo of so many returns, you hear above twenty words for three. The like echo upon echo, but only with two reports, has been observed by standing between a house and a hill, and hollowing towards the hill, for the house will give a back-echo, which may be mistaken for the other, though the latter be the weaker.

There are certain letters which an echo can

hardly express—as S, for instance, especially when a principal letter in a word. Thus, when I went to hear the echo at Pont-Charenton, there was an old Parisian, who took it to be the work of good spirits, for, said he, call out Satan, and the echo will not deliver back the devil's name, but cries *va tén*, which, in French, is begone; and thereby I found that an echo would not return S, as being but a hissing and interior sound.

Some echoes are sudden, and chop again as soon as the voice is delivered, others are more deliberate, or take more time between the voice and the echo, which is caused by the nearness or distance; some will report a longer train of words and some a shorter, some as loud as the original, or sometimes louder, and others weaker and fainter. Where echoes come from several parts at the same distance, they must make, as it were, a choir of echoes, and so increase the report, and give a continued echo, as we find in some hills that stand in compass like a theatre.

It does not yet appear that there is any refraction in sounds, as in vision; for I do not think, if a sound should pass through different mediums, as air, cloth, wood, &c., it would deliver the sound in a different place from that where it tends, which is the proper effect of refraction.

SECTION XX.

THE RELATION AND DIFFERENCE BETWEEN LIGHT AND SOUND.

Both visible and audible species diffuse themselves in a sphere, and fill the whole thereof to certain limits, being carried to great lengths, but languish and lessen by degrees, according to the distance of the objects from the sensories. The whole species of both are in every small portion of the air or medium, so that they pass through small chinks without confusion, as appears from levels to the eye, and from slits to the ears. Both of them are suddenly and easily generated and propagated, and likewise perish swiftly and suddenly, as upon removal of the light, or touching the sounding body. Both of them receive and carry exquisite and accurate differences, as of colours, figures, motions, distances, in visibles; and of articulate voices, tones, songs, quavers, &c., in audibles. Both of them in their virtue and operation appear to emit no corporeal substance into their mediums, or the sphere of their activity, nor to cause any evident local motion in their mediums as they pass, but only to carry certain spiritual forms, the perfect knowledge of the cause whereof is hitherto scarcely attained. Both of them seem not to generate or produce any other effect in nature, but such as appertains to their proper objects and senses, and are otherwise barren. But both of them, in their own proper action, have three manifest effects: the first is, that the stronger species drown the lesser, as the sun drowns the light of the stars, and the report of ordnance the voice. The second, that an

object of surcharge, or excess, destroys the sense; as the light of the sun the eye, and a violent sound the hearing. The third is, that both of them may be reverberated, as in mirrors and echoes. Neither of them destroys or hinders the species of the other, though they meet in the same medium, as light or colour does not hinder sound, and *vice versâ*. Both of them affect the sense in living creatures, and yield objects of pleasure and dislike; though these objects also affect and operate upon inanimate thing—viz., such as have some conformity with the organs of the two senses; thus the visible species operate upon a lens, which is like the pupil of the eye, and the audible upon places of echo, which, in some sort, resemble the cavern and structure of the ear. Both of them operate variously, according to the disposition of the medium; thus a trembling medium, as smoke, makes the object appear to tremble, and a rising or falling medium, as the air disturbed by winds, makes the sounds therein to rise or fall. The medium most favourable to both, is air, whereto glass, water, &c., are not comparable. In both of them, where the object is fine and accurate, it greatly conduces to have the sense intent and erect; thus we contract the eye when we would see sharply, and erect the ear when we would hear attentively, which, in beasts that have moveable ears, is more manifest. The rays of light, when multiplied and condensed, generate heat, which is a different action from the action of sight; and the multiplication and condensation of sounds generates an extreme rarefaction of the air, which is a material action, differing from the action of sound, if it be true that birds in their flight have been made to fall down by great shouts.

(To be continued.)

Brief Chronicle of the last Month.

ALFORD.—A concert was given in the Corn Exchange, on the 10th of December, for the benefit of the Mechanics' Institution, which was well attended. The principal performers were Messrs. F. Kew, H. Brown, A. Kew, and L. Wilson. Mr. A. Kew performed a fantasia on the violoncello, and the whole was under the direction of Mr. H. Brown.

ARCHITECTURAL GALLERY, CONDUIT STREET.—The first meeting of the Motett Choir, for this season, took place here on the 17th of December, when the performances comprised a Mass, by Palestrina, and several latin hymns and anthems. There were also three carols, with which the audience were delighted.—The Arion Vocal and Instrumental Society gave a concert in this room on the 18th of December, when they performed the *Creation*. The principal singers were Mrs. A. Gilbert, Mr. Morgan, and Mr. Lawler. Leader, Mr. Evans; conductor, Mr. A. Gilbert. The society has availed itself of an instrument called the Orchestrion, by means of which several wind instruments are efficiently represented. There was also a small band, so that the accompaniments were ably sustained. The choruses were given with much neatness and precision, by a well-drilled body of singers. The oratorio was altogether well got up, and the performance deserved much praise. A series of concerts are advertised to be given by this society, at the Eyre Arms, St. John's Wood, and the Westbourne Hall,